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Procedia Engineering 44 (2012) 787 – 788

Procedia Engineering

www.elsevier.com/locate/procedia

Title:

Simulation of MEG packed distillation column using an equilibrium stage model- Case study on operating parameters of Farsa Petrochemical company- Assaluyeh-Iran

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ABSTRACT

Two types of equilibrium and non-equilibrium stage models are generally used to simulate the mass transfer of packed distillation column. Using non-equilibrium model requires the calculation of mass transfer coefficients, thus, usually equilibrium-based methods are preferred to be used for simulations of distillation columns.

In this paper, packed column distillation of production of Mono Ethylene Glycol in FARSA SHIMI Company (Assaluyeh - Iran)'s Ethylene Glycol portion has been simulated through using the equilibrium model and solving the related equations. The simulation has been carried out in the MATLAB environment. The column also has been simulated in the Aspen Hysys and Aspen Plus ver.2006.5 environments. Then, the output has been compared with software results, designing and operating data of the underlying columns which demonstrate good consistency with the model. Having the model validated, the effect of some operating parameters has been analyzed through the model.

KEY WORDS

Distillation; Packed Column; Modeling; Equilibrium and non-equilibrium models

Simulation of Mono Ethylene Glycol Column

Ethylene glycol is produced under vacuum distillation conditions. Water contamination in Glycol mixture must be removed before the separation of Mono Ethylene Glycol from heavier Glycols like DEG & TEG. In Industrial practice, MEG is separated from heavier Glycols using two vacuum columns in a sequence.

In this study, top and bottom pressures of T-5001 are kept at 23 & 25 KPa respectively. The temperature is then increased from 154 to 160˚C. MEG of high purity (99.99 wt percent) was drawn out from the first bed and sent to storage. Heavier product was taken from bottom of distillation column and sent to next unit to be separated. In this column, structured packing (of MELLAPACK250Y type) has been used. There are 3 beds in the columns of heights of 1470, 4620, 1890 mm respectively from top to bottom with a total height of 7980 mm [11]

To simulate the column, above equations were solved in the MATLAB environment. The HETP value is considered 400 mm based on the manufacturer's data. Rault's law and Antoine equations are used to evaluate vapor component pressure and the equilibrium constants as the column is at vacuum pressure. For vapor and liquid enthalpy, ideal gas and Clausius- Clapeyron equations have been used. The influence of conduction heat transfer between packing and fluid has been neglected.

doi:10.1016/j.proeng.2012.08.570

Summaries

The model for processing Glycol plants has been built up in two different Hysys environments. A mathematical model has also been developed to predict the columns of the plant. The design and plant operational data have been used for verification. The investigation shows that the Hysys based simulations provide good predictions but the predictions based on the equilibrium model are of better capability in predicting thermal behaviour. Further studies have been carried out on the reflux ratio and feed tray location using the same model.

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